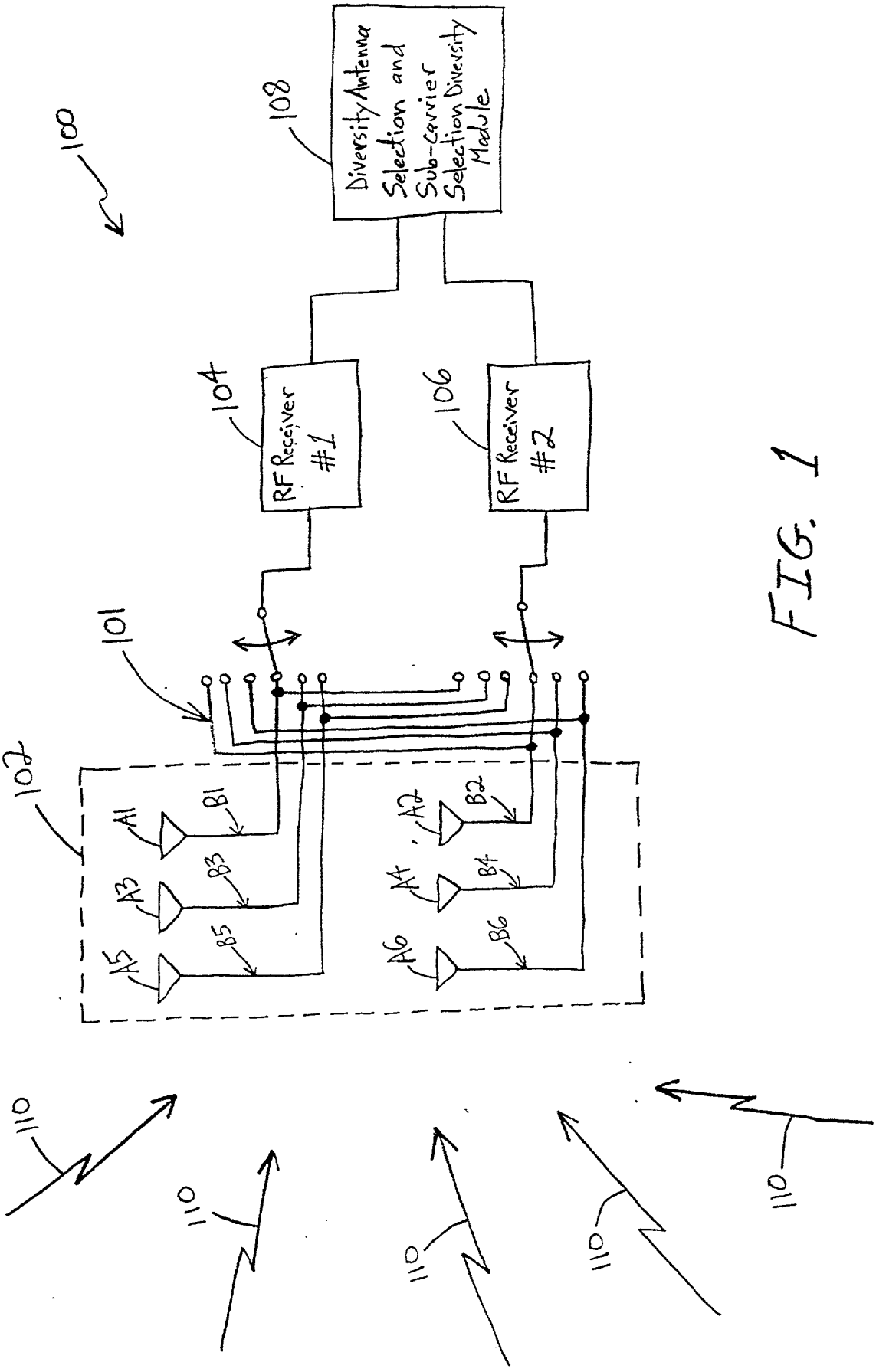
100
108
Diversity Antenna Selection and Sub-Carrier Selection Diversity Module
104
RF Receiver #1
106
RF Receiver #2
101
102
A1
B1
A3
B3
A5
B5
A2
B2
A4
B4
A6
B6
110
110
110
110
110

FIG. 1

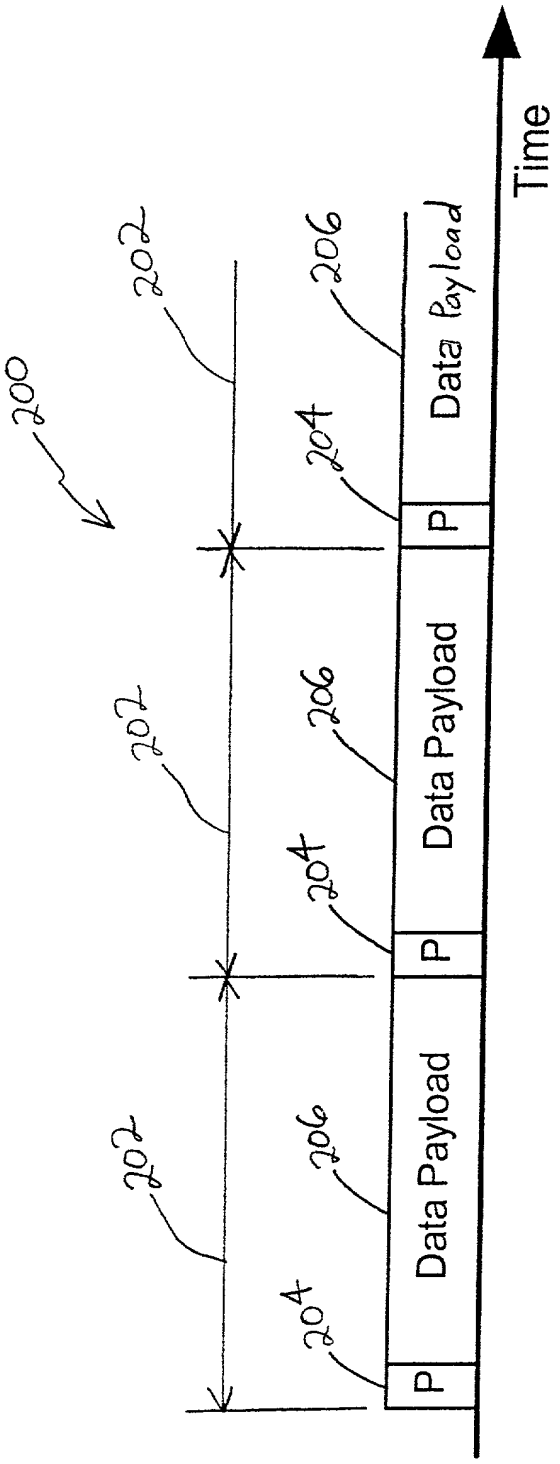

FIG. 2 (Prior Art)

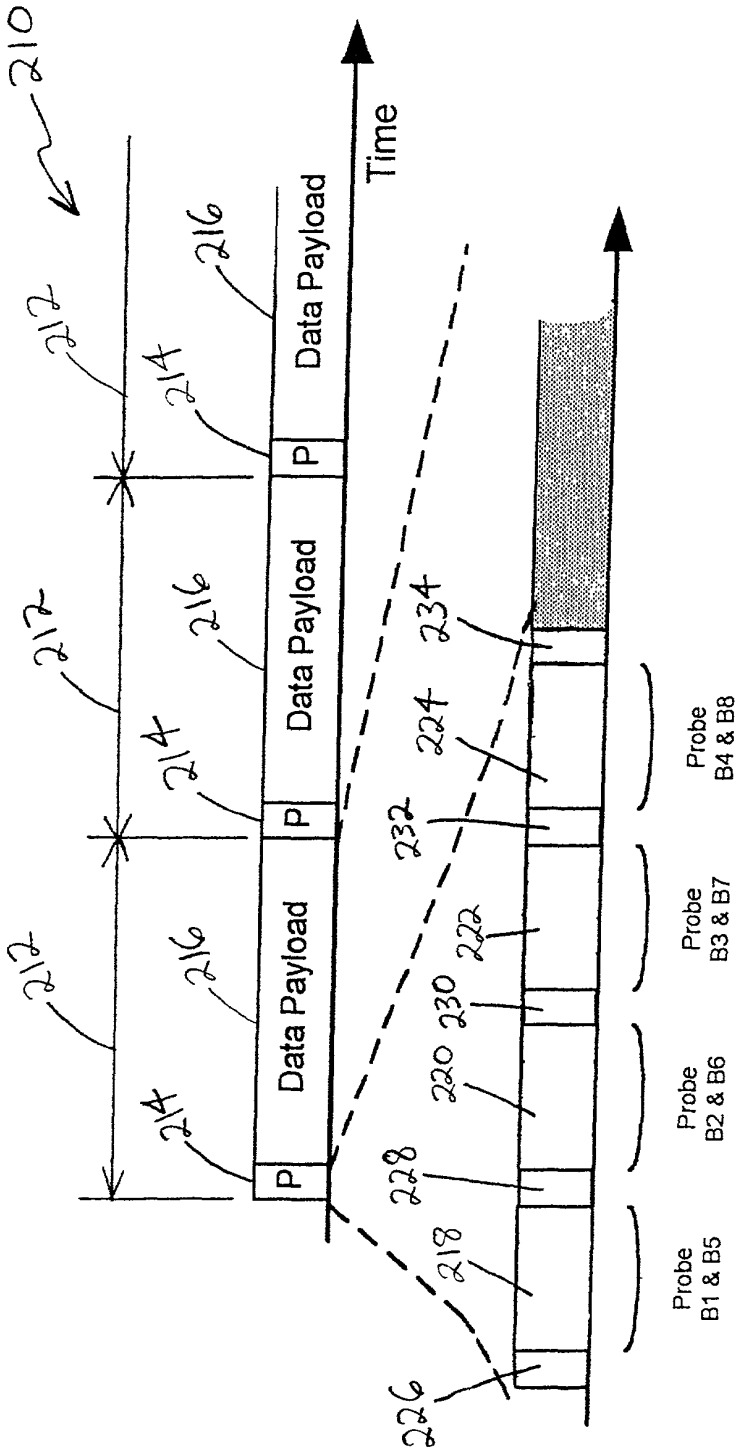
210
Time
212
214
216
P
Data Payload
218
220
222
224
226
228
230
232
234
Probe B1 & B5
Probe B2 & B6
Probe B3 & B7
Probe B4 & B8

FIG. 3

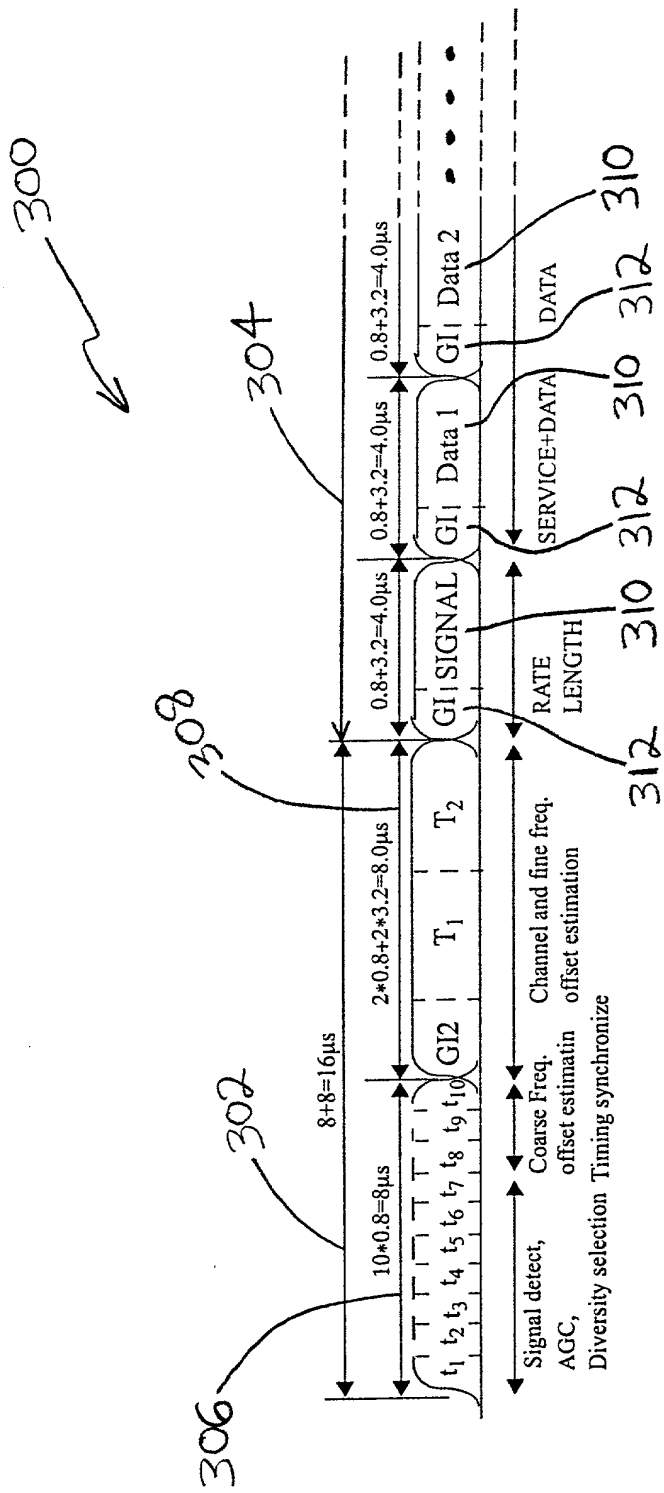

FIG. 4 (Prior Art)

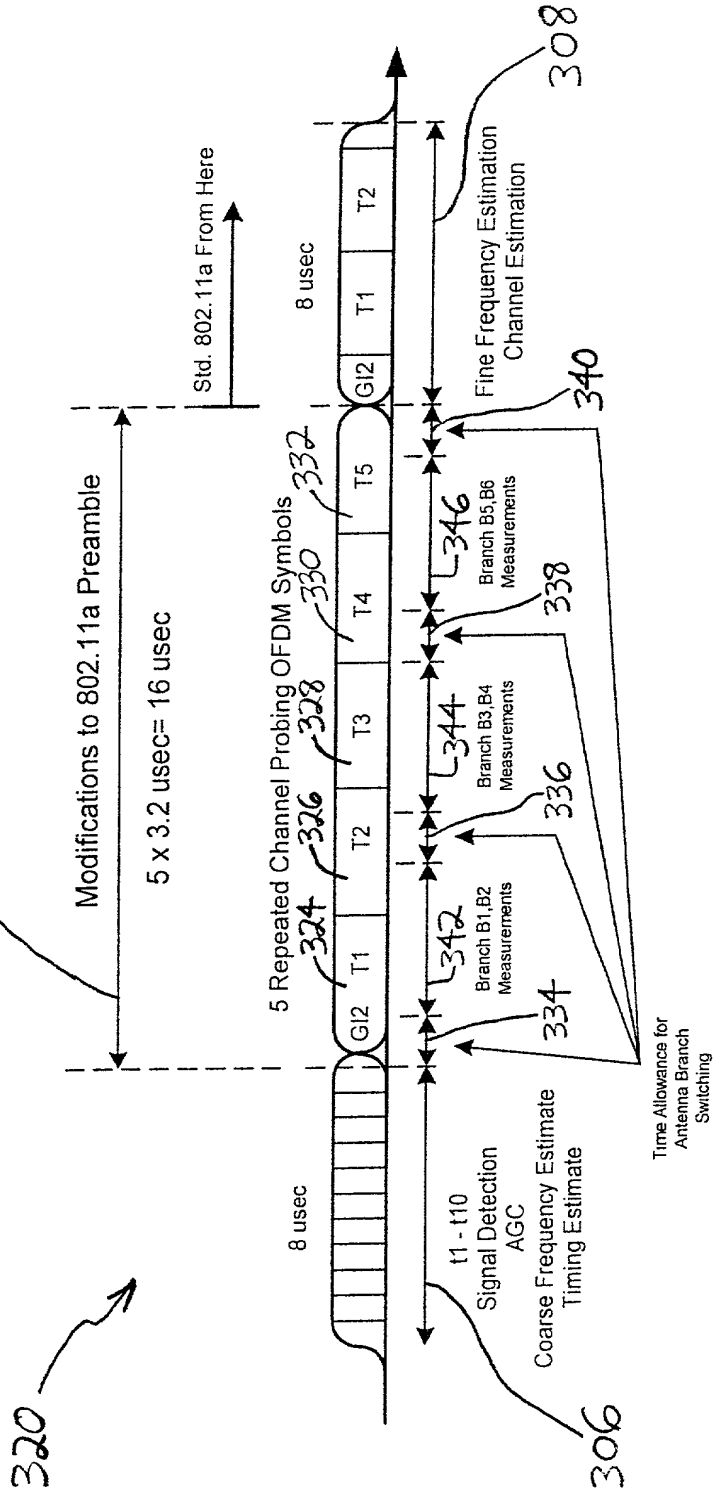
320
322
Modifications to 802.11a Preamble
5 x 3.2 usec= 16 usec
Std. 802.11a From Here
8 usec
5 Repeated Channel Probing OFDM Symbols
GI2
T1
T2
T3
T4
T5
8 usec
Fine Frequency Estimation
Channel Estimation
308
340
346
Branch B5,B6
Measurements
338
344
Branch B3,B4
Measurements
336
342
Branch B1,B2
Measurements
334
Time Allowance for
Antenna Branch
Switching
t1 - t10
Signal Detection
AGC
Coarse Frequency Estimate
Timing Estimate
306

FIG. 5

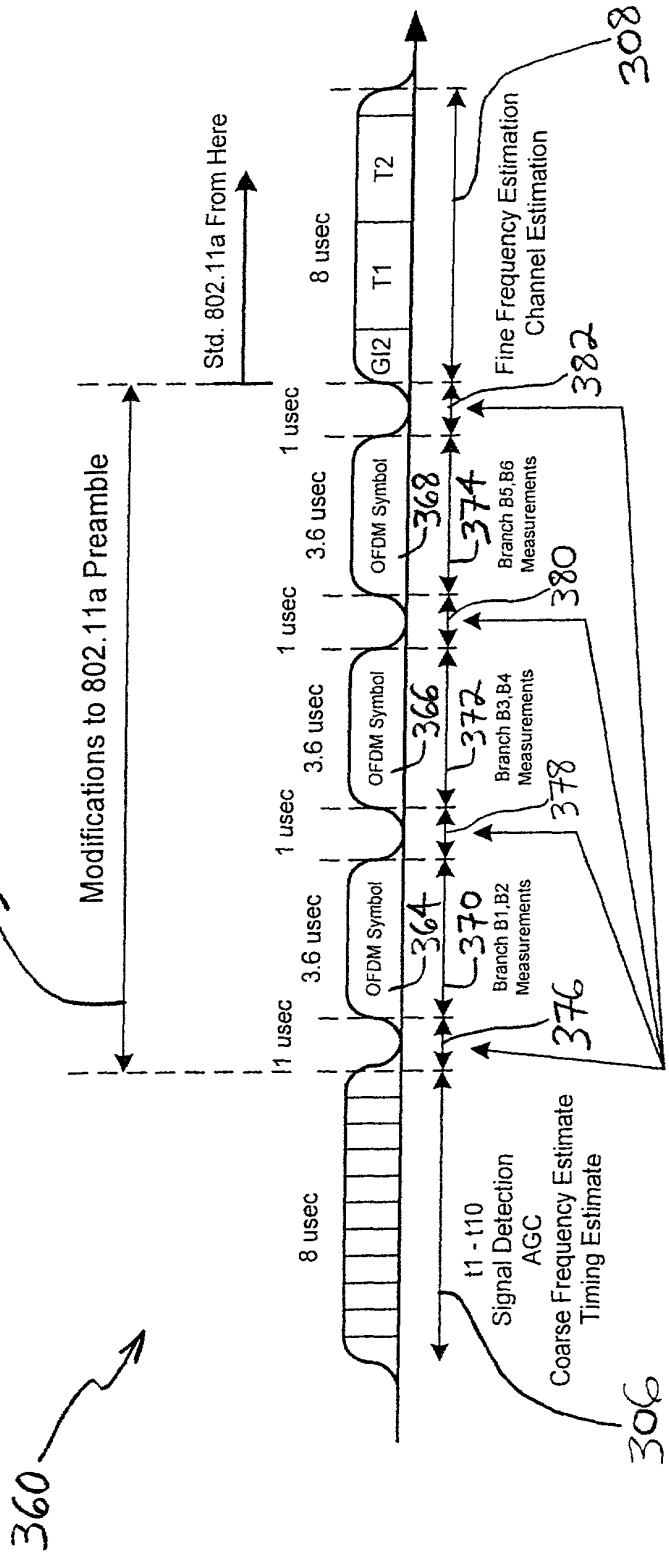
360
362
Modifications to 802.11a Preamble
Std. 802.11a From Here
8 usec
1 usec
3.6 usec
1 usec
3.6 usec
1 usec
3.6 usec
1 usec
8 usec
G12
T1
T2
OFDM Symbol
OFDM Symbol
OFDM Symbol
364
366
368
370
372
374
376
378
380
382
308
306
t1 - t10
Signal Detection
AGC
Coarse Frequency Estimate
Timing Estimate
Branch B1,B2 Measurements
Branch B3,B4 Measurements
Branch B5,B6 Measurements
Fine Frequency Estimation
Channel Estimation
Time Allowance for Antenna Branch Switching

FIG. 6

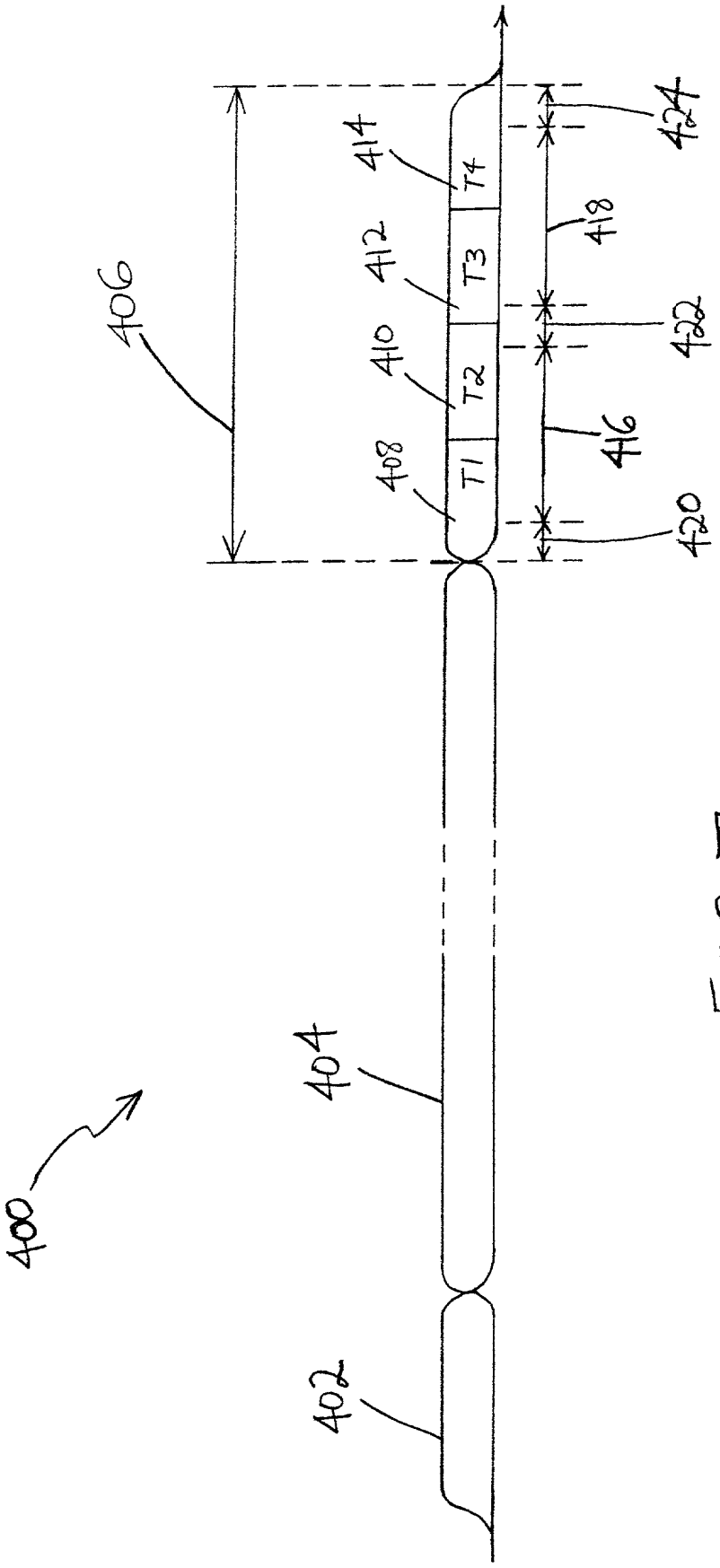

FIG. 7

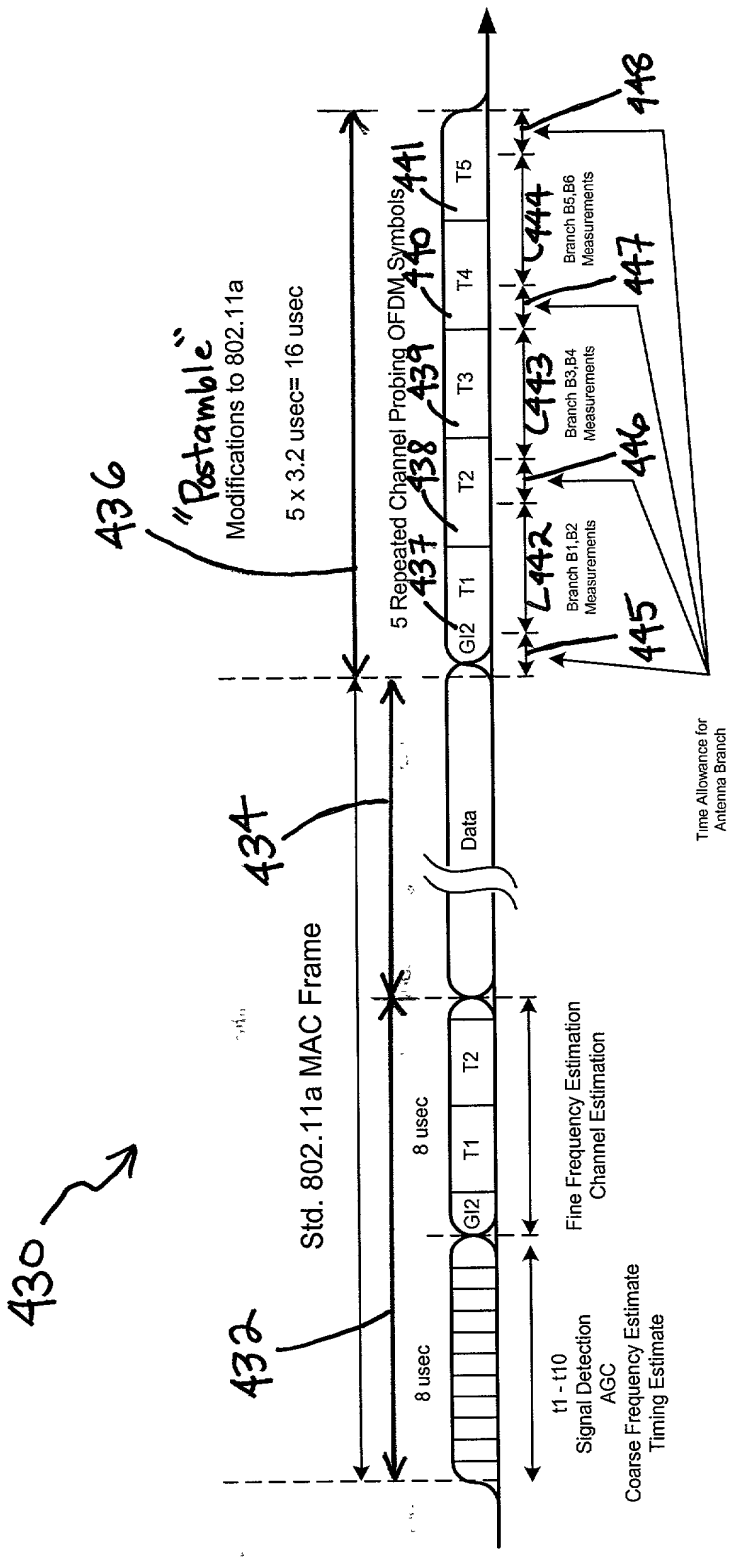
430
Std. 802.11a MAC Frame
432
8 usec
GI2
T1
T2
8 usec
434
Data
436
"Postamble"
Modifications to 802.11a
5 x 3.2 usec= 16 usec
5 Repeated Channel Probing OFDM Symbols
GI2
T1
T2
T3
T4
T5
437
438
439
440
441
t1 - t10
Signal Detection
AGC
Coarse Frequency Estimate
Timing Estimate
Fine Frequency Estimation
Channel Estimation
Branch B1,B2 Measurements
Branch B3,B4 Measurements
Branch B5,B6 Measurements
442
443
444
445
446
447
448
Time Allowance for Antenna Branch Switching

FIG. 8

Docket #70629

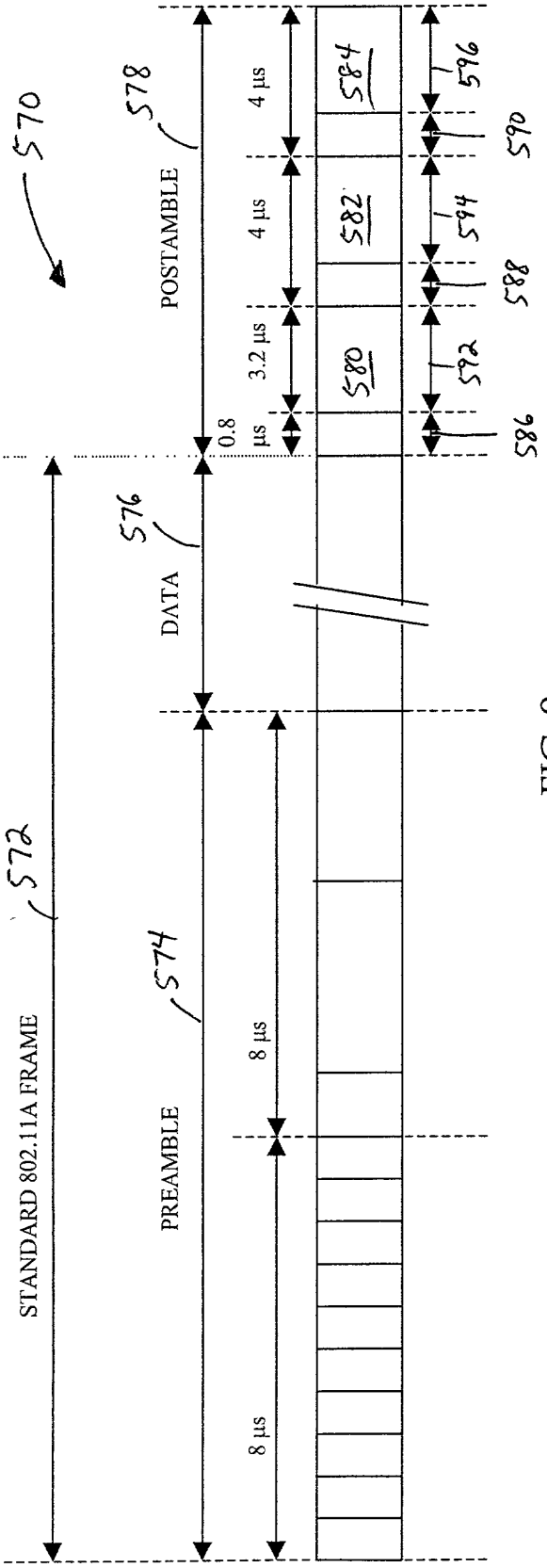

FIG. 9

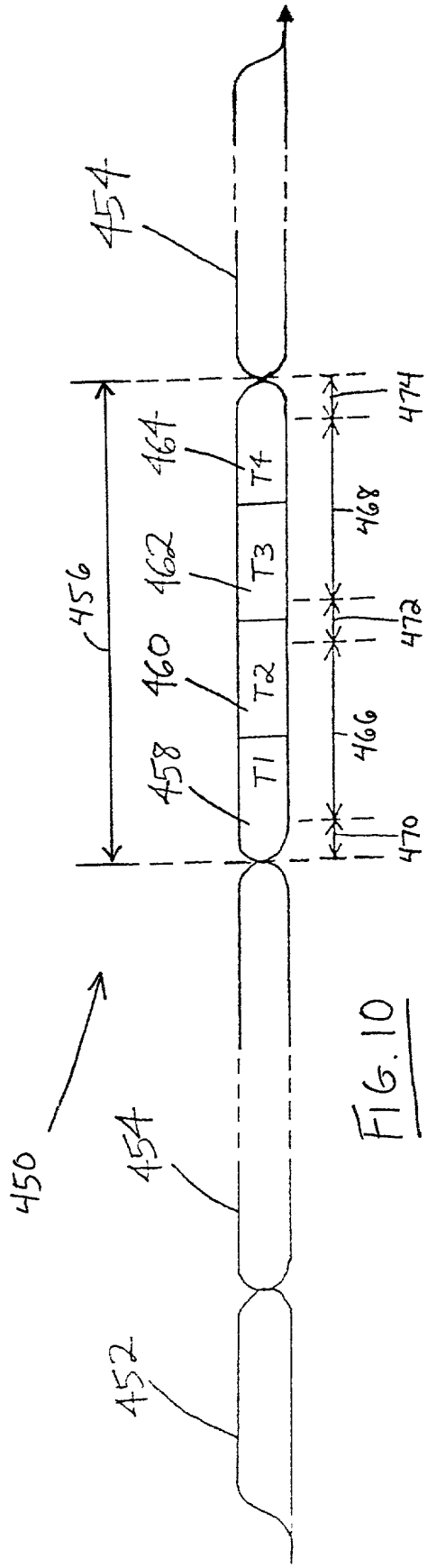

FIG. 10

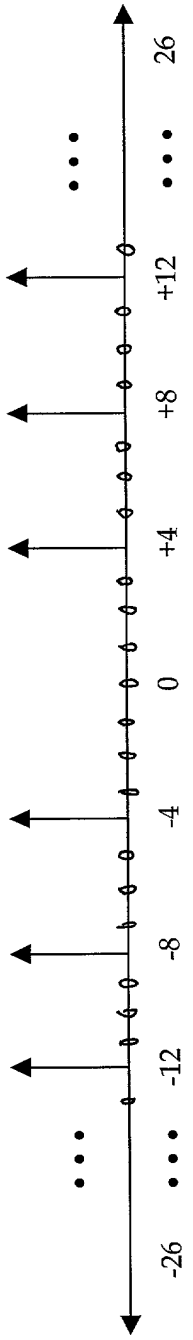

FIG. 11

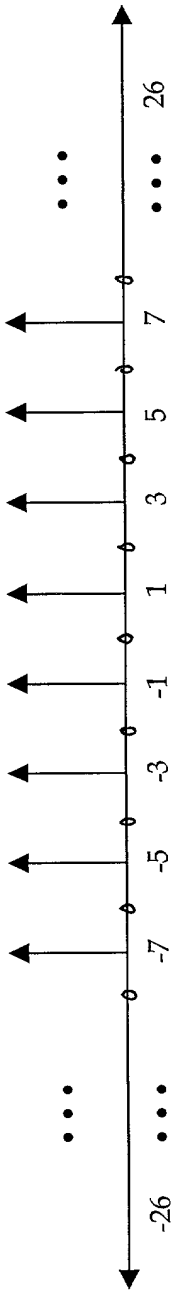

FIG. 12

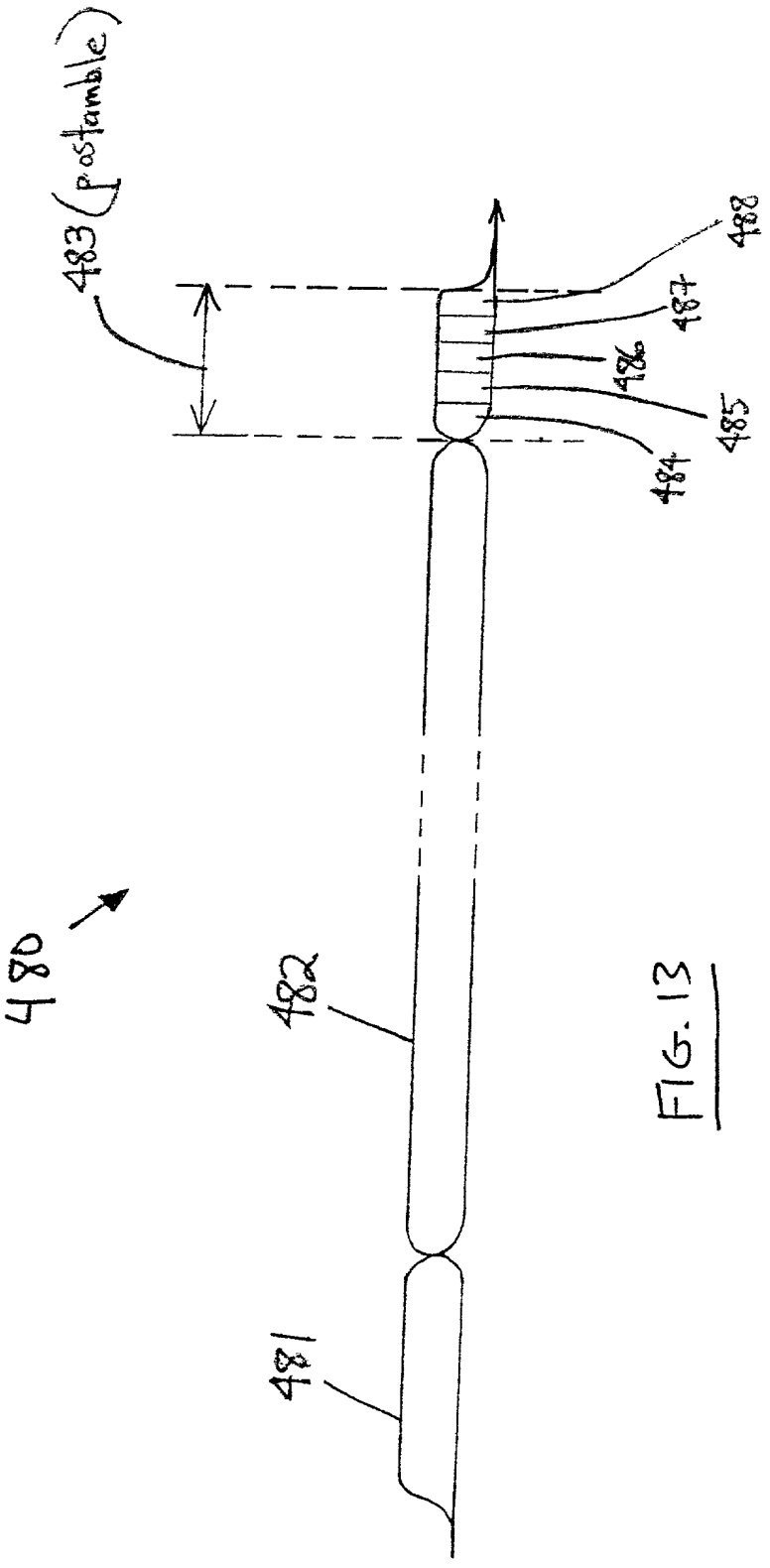

FIG. 13

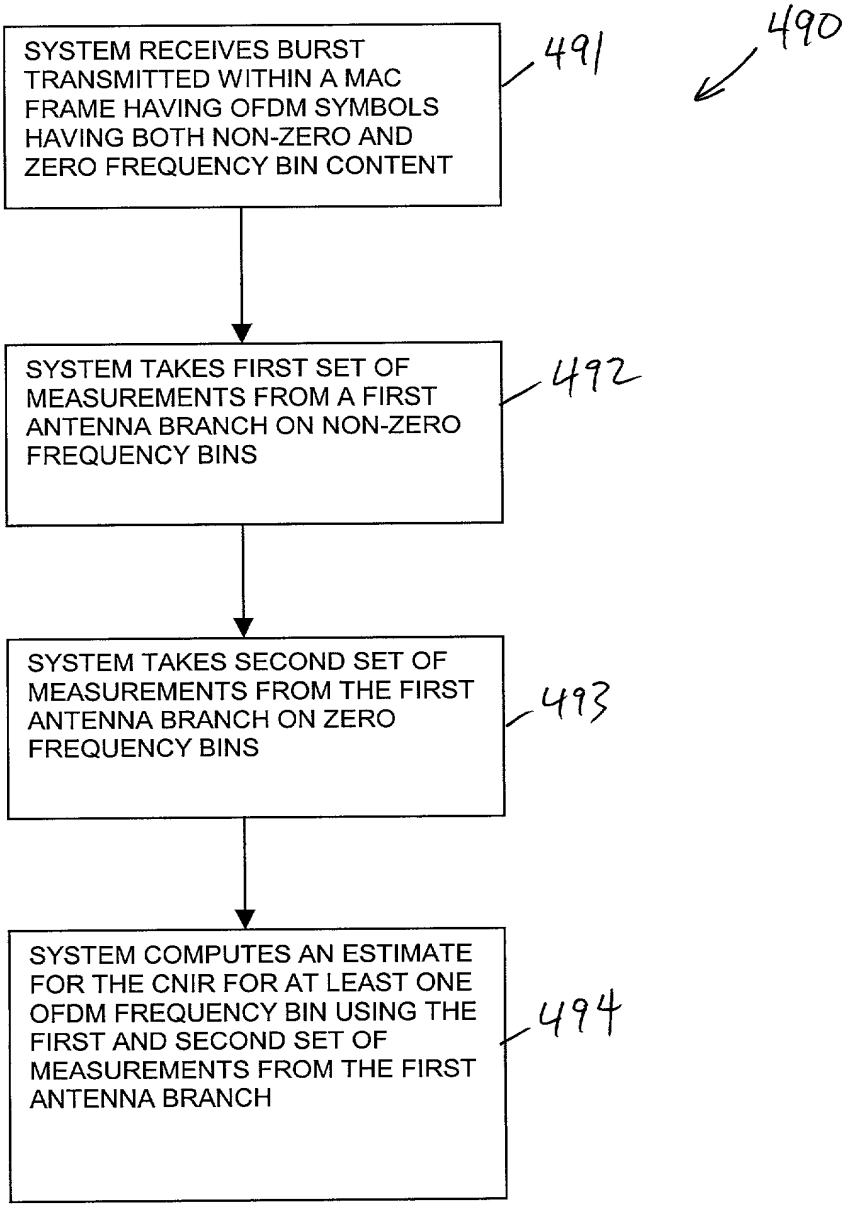
SYSTEM RECEIVES BURST TRANSMITTED WITHIN A MAC FRAME HAVING OFDM SYMBOLS HAVING BOTH NON-ZERO AND ZERO FREQUENCY BIN CONTENT
491
490
SYSTEM TAKES FIRST SET OF MEASUREMENTS FROM A FIRST ANTENNA BRANCH ON NON-ZERO FREQUENCY BINS
492
SYSTEM TAKES SECOND SET OF MEASUREMENTS FROM THE FIRST ANTENNA BRANCH ON ZERO FREQUENCY BINS
493
SYSTEM COMPUTES AN ESTIMATE FOR THE CNIR FOR AT LEAST ONE OFDM FREQUENCY BIN USING THE FIRST AND SECOND SET OF MEASUREMENTS FROM THE FIRST ANTENNA BRANCH
494

FIG. 14

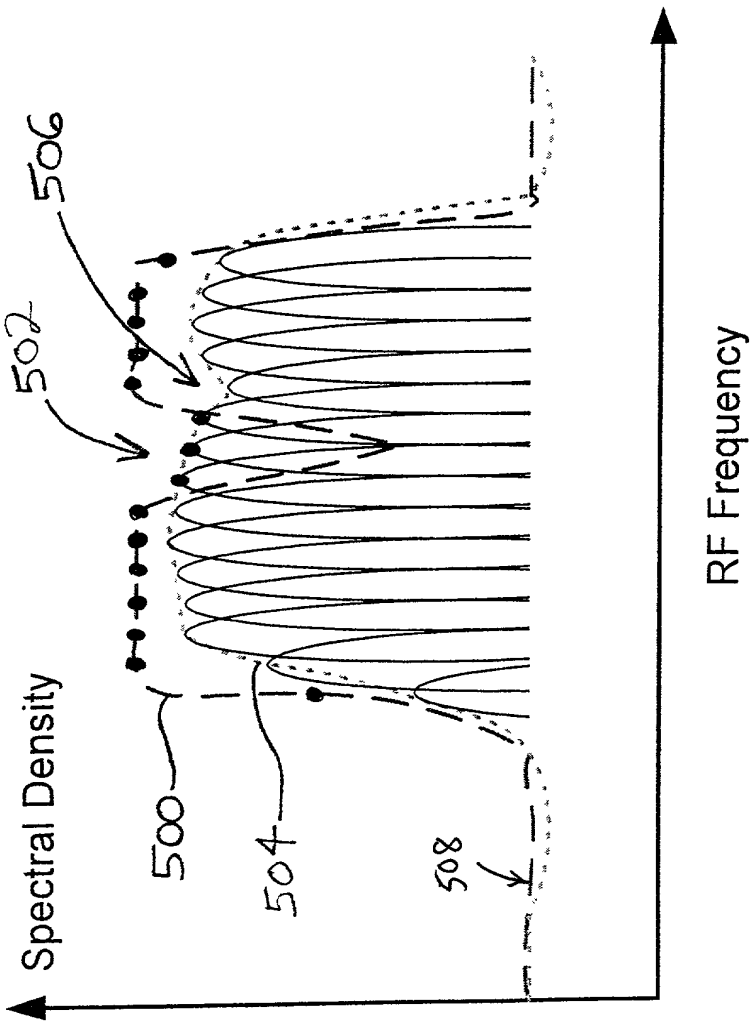

FIG. 15

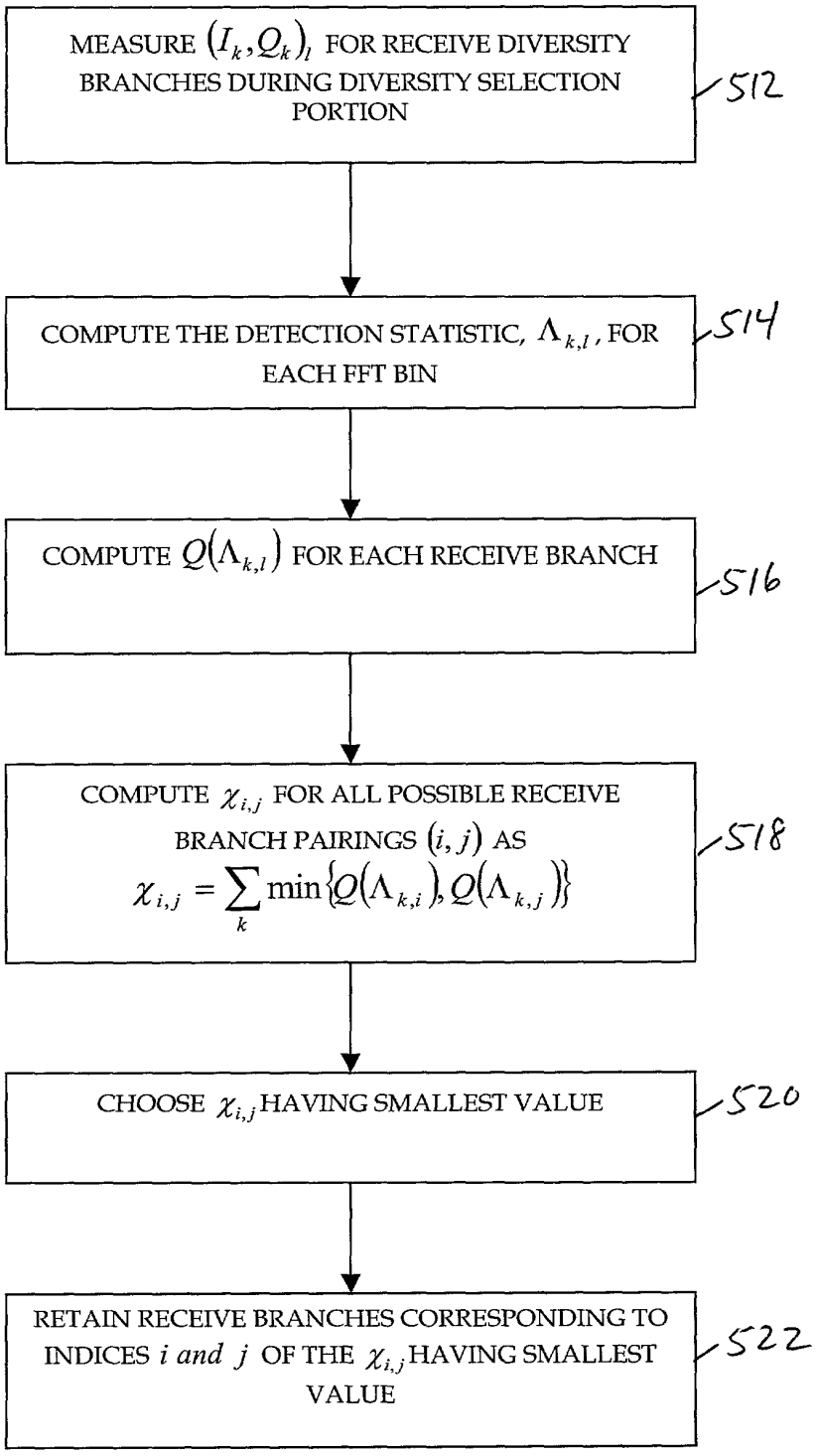
MEASURE $(I_k, Q_k)_l$ FOR RECEIVE DIVERSITY BRANCHES DURING DIVERSITY SELECTION PORTION
512
510
COMPUTE THE DETECTION STATISTIC, $\Lambda_{k,l}$, FOR EACH FFT BIN
514
COMPUTE $Q(\Lambda_{k,l})$ FOR EACH RECEIVE BRANCH
516
COMPUTE $\chi_{i,j}$ FOR ALL POSSIBLE RECEIVE BRANCH PAIRINGS (i, j) AS $\chi_{i,j} = \sum_k \min\{Q(\Lambda_{k,i}), Q(\Lambda_{k,j})\}$
518
CHOOSE $\chi_{i,j}$ HAVING SMALLEST VALUE
520
RETAIN RECEIVE BRANCHES CORRESPONDING TO INDICES *i and j* OF THE $\chi_{i,j}$ HAVING SMALLEST VALUE
522

FIG. 16

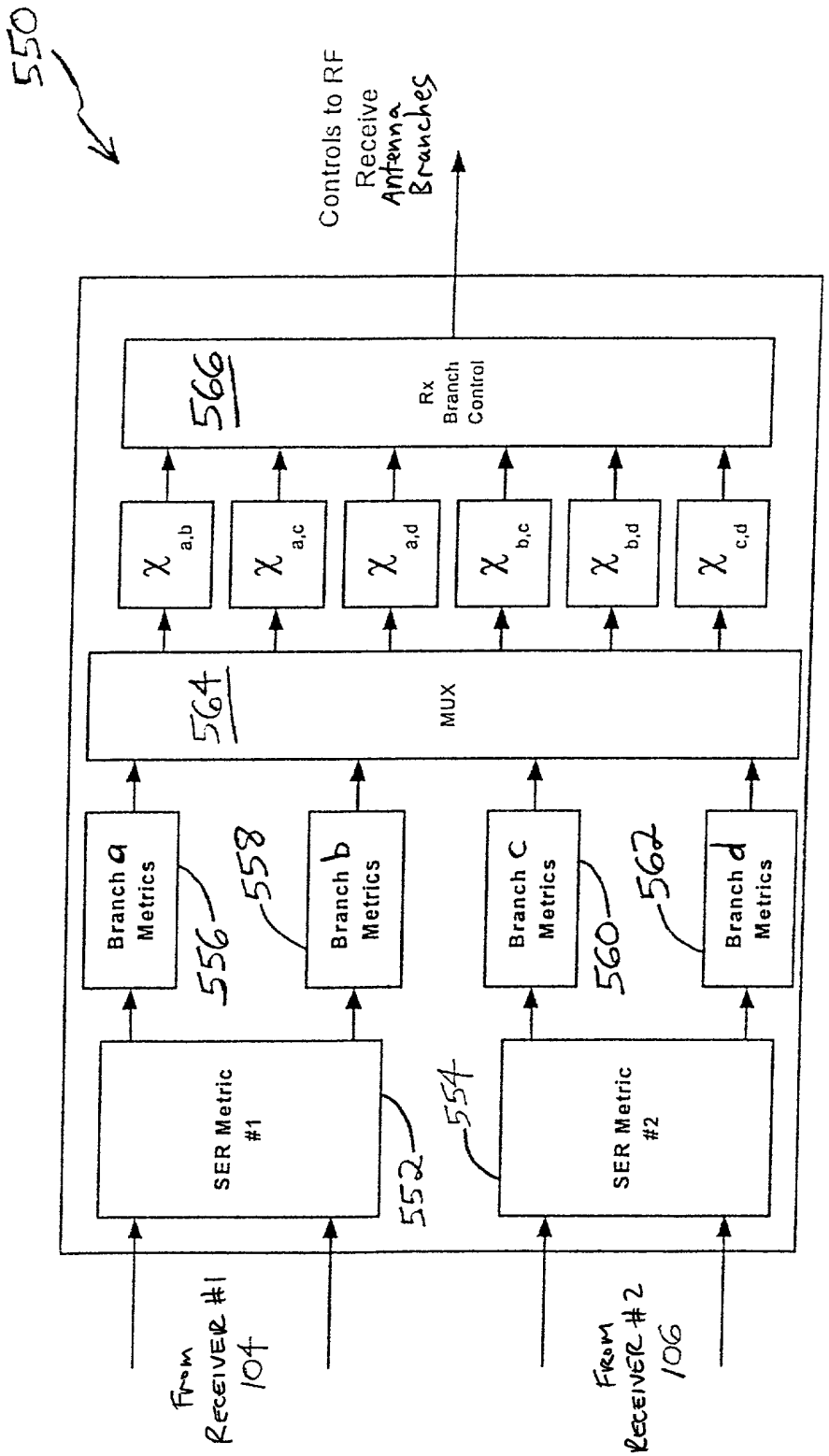
550
Controls to RF Receive Antenna Branches
566
Rx Branch Control
χ a,b
χ a,c
χ a,d
χ b,c
χ b,d
χ c,d
564
MUX
Branch a Metrics
Branch b Metrics
Branch c Metrics
Branch d Metrics
556
558
560
562
SER Metric #1
SER Metric #2
552
554
From Receiver #1 104
From Receiver #2 106

FIG. 17

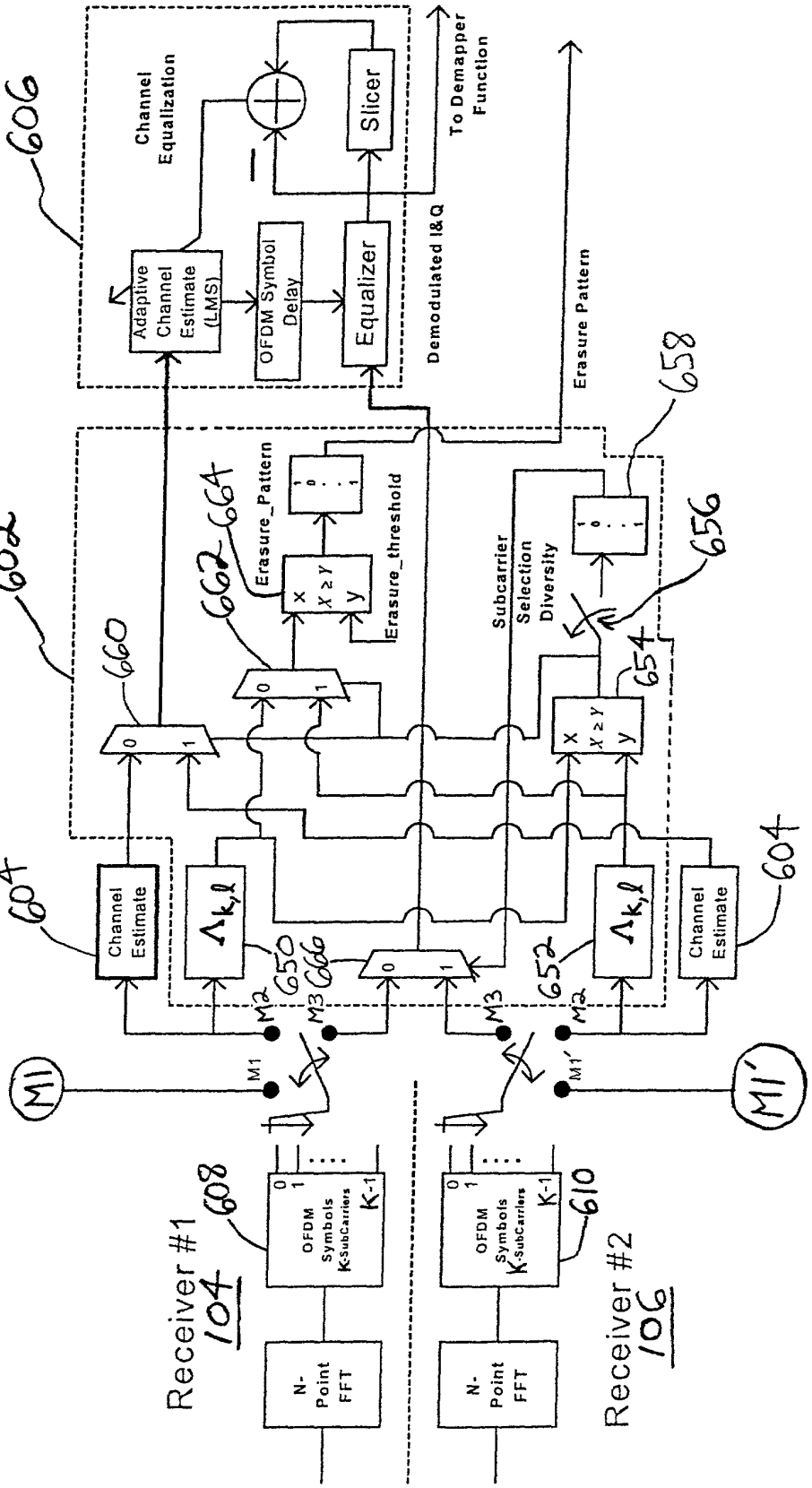
606
Channel Equalization
Slicer
To Demapper Function
Adaptive Channel Estimate (LMS)
OFDM Symbol Delay
Equalizer
Demodulated I&Q
Erasure Pattern
602
658
664
662
Erasure_Pattern
Erasure_threshold
Subcarrier Selection Diversity
656
660
654
604
Channel Estimate
650
652
M2
M3
M1
M1'
608
610
OFDM Symbols K-SubCarriers
N-Point FFT
Receiver #1
104
Receiver #2
106

FIG. 18A

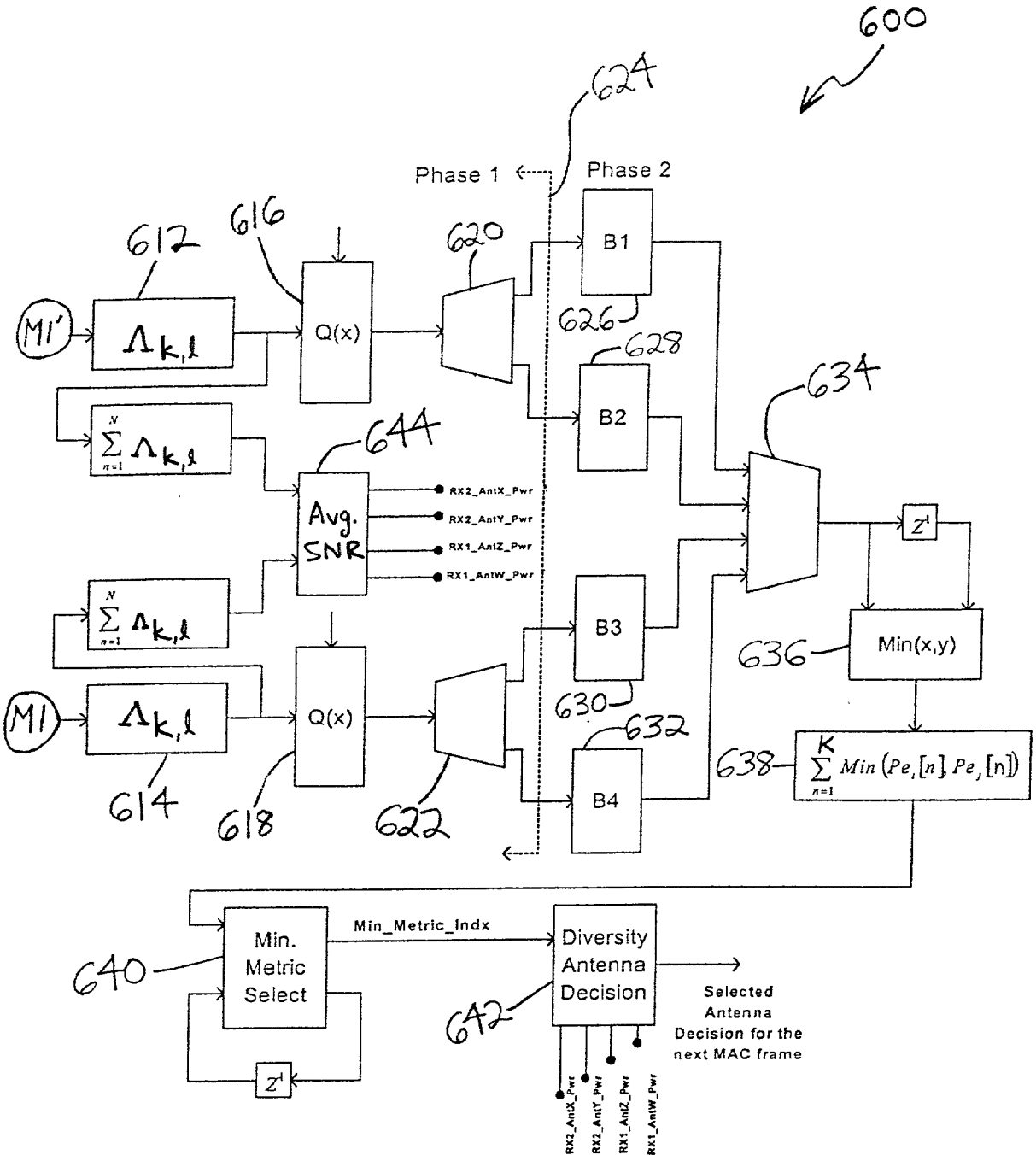
600
624
Phase 1
Phase 2
612
616
620
B1
626
628
B2
634
644
Avg. SNR
RX2_AntX_Pwr
RX2_AntY_Pwr
RX1_AntZ_Pwr
RX1_AntW_Pwr
Z-1
B3
636
Min(x,y)
630
632
B4
638
614
618
622
Q(x)
640
Min. Metric Select
Min_Metric_Indx
Diversity Antenna Decision
642
Selected Antenna Decision for the next MAC frame

FIG. 18B

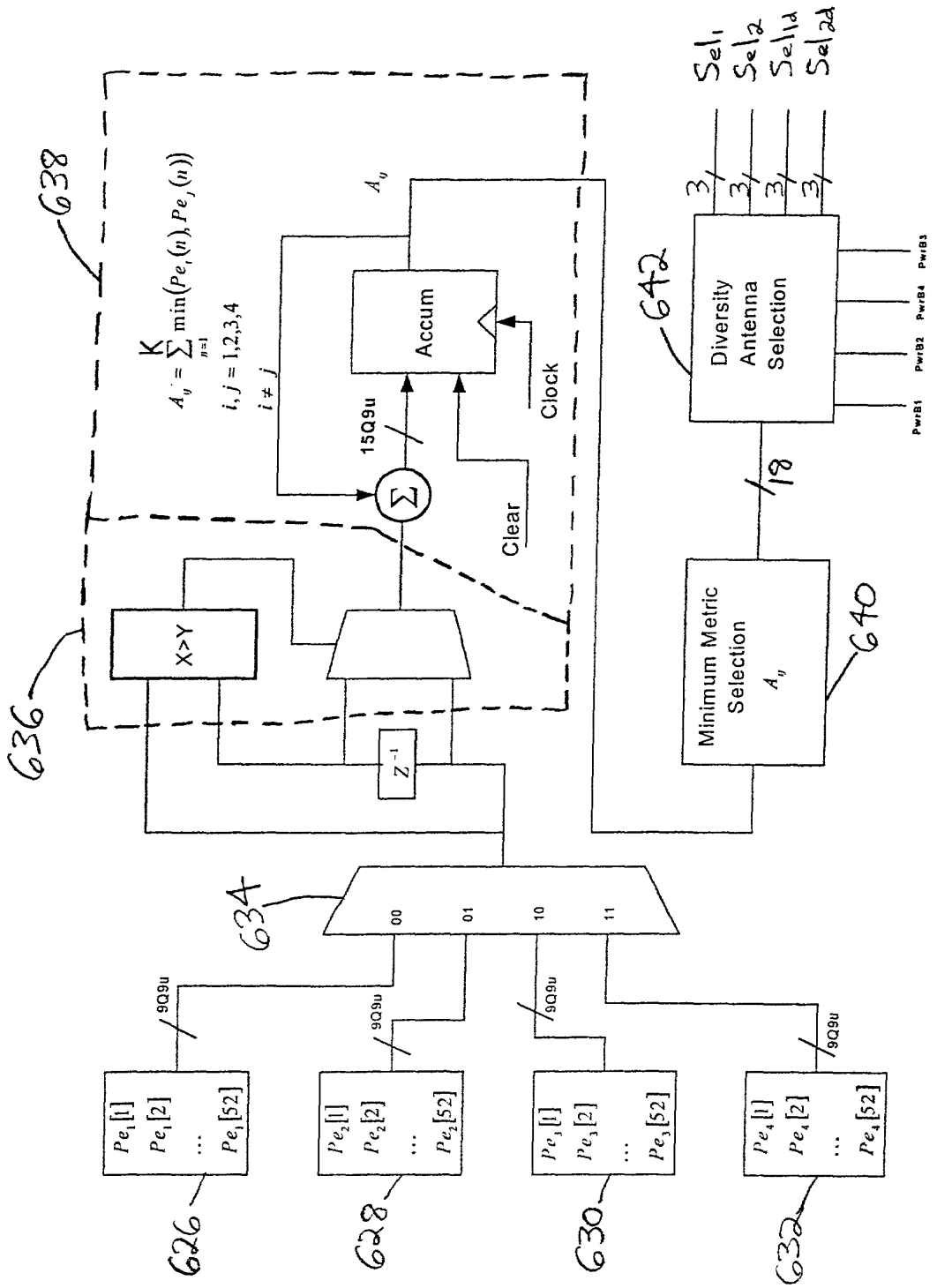
638
$A_v = \sum_{n=1}^{K} \min(Pe_i(n), Pe_j(n))$
$i, j = 1,2,3,4$
$i \neq j$
A_v
Accum
Clock
15Q9u
Clear
Σ
X>Y
Z^{-1}
636
642
Diversity Antenna Selection
Sel1
Sel2
Sel1d
Sel2d
3
PwrB1
PwrB2
PwrB4
PwrB3
18
Minimum Metric Selection A_v
640
634
00
01
10
11
9Q9u
$Pe_1[1]$ $Pe_1[2]$ ... $Pe_1[52]$
$Pe_2[1]$ $Pe_2[2]$ ... $Pe_2[52]$
$Pe_3[1]$ $Pe_3[2]$ ... $Pe_3[52]$
$Pe_4[1]$ $Pe_4[2]$ ... $Pe_4[52]$
626
628
630
632

FIG. 19

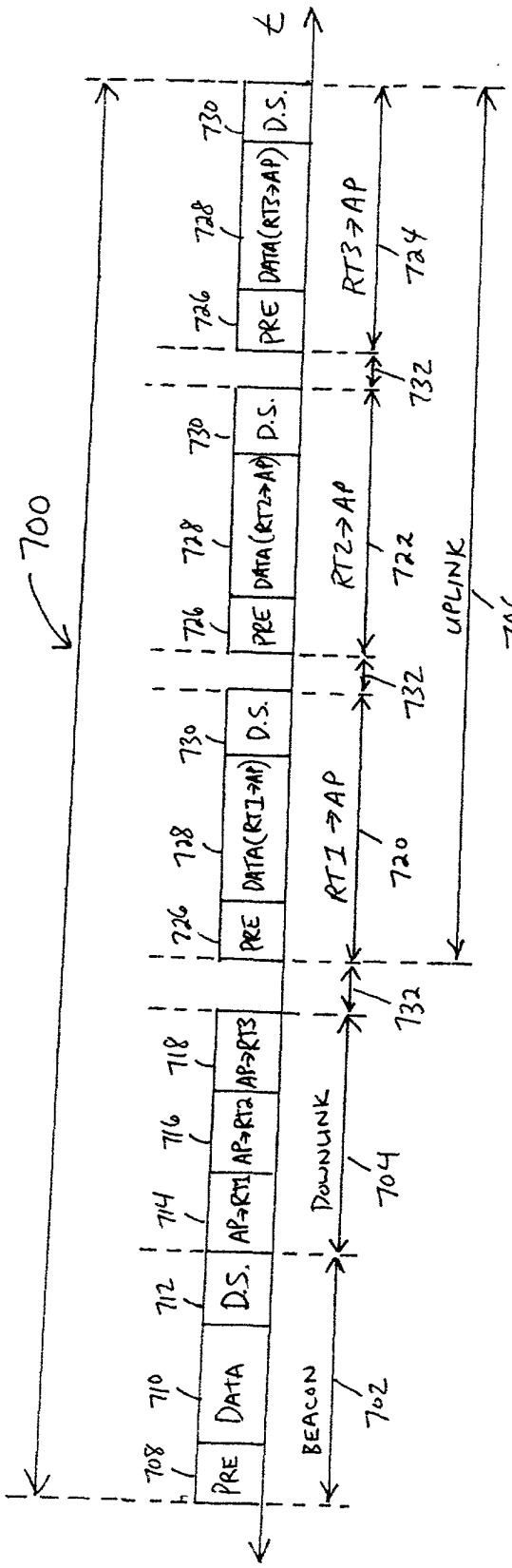
700
t
BEACON
DATA
D.S.
AP→RT1
AP→RT2
AP→RT3
PRE
DATA(RT1→AP)
DATA(RT2→AP)
DATA(RT3→AP)
RT1→AP
RT2→AP
RT3→AP
DOWNLINK
UPLINK
702
704
706
708
710
712
714
716
718
720
722
724
726
728
730
732

FIG. 20

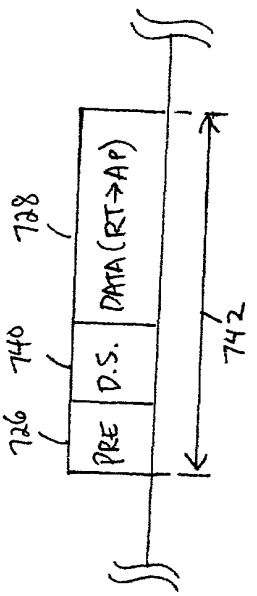
PRE
D.S.
DATA(RT→AP)
726
728
740
742

FIG. 21